

Tables and Graphs of Atomic Subshell and Relaxation Data Derived from the LLNL Evaluated Atomic Data Library (EADL), $Z = 1 - 100$

Abstract

Evaluated atomic subshell and relaxation data for isolated neutral atoms are given in tabular and graphical form for elements H through Fm ($Z=1 - 100$). These data include fluorescence yields, subshell parameters (e.g., binding energies), both radiative and nonradiative transition probabilities, as well as energy deposition terms. This information is derived from the Livermore Evaluated Atomic Data Library (EADL) as of July, 1991.

Overview

The (Evaluated Nuclear Data Library) ENDL family of evaluated data libraries¹ is currently being updated to include complete photon and electron interaction data plus atomic relaxation data to couple photons and electrons. The specific purpose of all of these files is to furnish data for particle transport calculations. All of the data bases will be completely consistent; they will conserve energy and all will use the same atomic parameters (e.g., subshell binding energies). These data bases will allow complete coupled electron-photon transport calculations to be performed in a consistent manner.

This volume documents the evaluated atomic data library (EADL). The new evaluated photon library, EPDL, has recently been documented^{2,3}. The documentation of the evaluated electron data library (EEDL) will follow shortly⁴.

As in past volumes of this series describing evaluated data libraries, the emphasis here is on presenting an overview of the contents of the EADL, as well as an explanation of the data contained herein, so that it may be correctly interpreted and used. For further details of the methods used to create the current library and a description of the complete contents of this library, see Ref. 5.

Introduction

The Livermore Evaluated Atomic Data Library (EADL) contains data for isolated, neutral atoms of the elements H through Fm ($Z = 1 - 100$). The data in this library includes subshell parameters, relaxation parameters, and energy deposition terms. The basic subshell data are electron number, binding energy, kinetic energy, and expectation value of the radius. Relaxation parameters for both radiative and nonradiative transitions include transition probabilities as well as the level widths. Fluorescence yields were derived from the transition probabilities, and energy deposition terms were derived from both the transition probabilities and the binding energies. As with all ENDL-type evaluated libraries, the energy depositions include the average total energy into all outgoing particle fields, in this case x-rays and electrons, plus a local deposition term equal to all energy not explicitly assigned to an outgoing particle, to insure an exact energy balance.